

## Appendix C9. Spawning Surveys

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## **C9.1 METHODS**

Green Diamond's staff does not attempt to generate any form of formal population or escapement estimates from the spawning surveys conducted. Due to the limitations of time, water conditions, and weather these surveys tend to be opportunistic rather than at fixed time intervals or fixed reaches. The purpose of these spawning surveys is to determine habitat use and relative numbers of spawners of all species as well as watershed conditions during the winter months. In general, the entire anadromous reach accessible to coho salmon is surveyed. In long anadromous reaches within one stream, the survey may be broken up into sub-reaches that tend to be based on accessibility and/or time available for the survey. Because of these constraints the surveys are somewhat inconsistent from year to year. Sub-reaches within one watershed may or may not be surveyed on the same day or by the same crew. Within each HPA a general description of the sub-reaches for each stream for which spawner surveys have been conducted are provided.

The following list indicates all streams by their Hydrographic Planning Area (HPA) for which spawning surveys have been conducted since 1995:

<b>Stream</b>	<b>HPA</b>
• Maple Creek	Coastal Lagoons
• North Fork Maple Creek	Coastal Lagoons
• Pitcher Creek	Coastal Lagoons
• Cañon Creek	Mad River
• Carson Creek	Little River
• Danielle Creek	Little River
• Little River	Little River
• Upper South Fork Little River	Little River
• Lower South Fork Little River	Little River
• North Fork Mad River	North Fork Mad River
• Railroad Creek	Little River
• Rowdy Creek	Smith River
• Salmon Creek	Humboldt Bay
• Savoy Creek	Smith River
• South Fork Rowdy Creek	Smith River
• South Fork Winchuck River	Smith River
• Sullivan Gulch	North Fork Mad River
• Wilson Creek	Smith River

## **C9.2 RESULTS**

### **C9.2.1 Smith River HPA**

Spawning surveys have been conducted on five streams within the Smith River HPA during the period of 1998 through 2000. The summaries of the results of these surveys follow.

### **C9.2.1.1 South Fork Winchuck River**

The survey reach extends from the confluence of South Fork and mainstem Winchuck upstream approximately four miles to the end of the W1100 road.

#### **C9.2.1.1.1 1998-1999 Spawning Surveys**

Two spawning surveys were conducted on South Fork Winchuck River during 1998-1999: December 10, 1998 and January 8, 1999. The results of these surveys are shown below.

#### **Live Fish Observed**

46 Chinook  
1 Steelhead  
2 Unknown

#### **Redds Observed**

21 Chinook  
29 Unknown

#### **Carcasses Observed**

7 Chinook

### **C9.2.1.2 Rowdy Creek**

The two Rowdy Creek spawning survey reaches extend from the county bridge on Rowdy Creek Road upstream 13,000 feet to the R1400 bridge and then an additional 7,600 feet upstream to the confluence of Rowdy and Copper Creeks.

#### **C9.2.1.2.1 1998-1999 Spawning Surveys**

One spawning survey was conducted on December 15, 1998 on Rowdy Creek during 1998-1999. The results of this survey are shown below.

#### **Live Fish Observed**

11 Chinook

#### **Redds Observed**

4 Chinook  
3 Unknown

#### **Carcasses Observed**

None Observed

### **C9.2.1.3 Savoy Creek**

The spawning reach extends from the confluence with South Fork Rowdy upstream 3,100 feet to the anadromous barrier.

#### **C9.2.1.3.1 1999-2000 Spawning Surveys**

Two spawning surveys were conducted on December 3<sup>rd</sup> and 21<sup>st</sup>, 1999 on Savoy Creek during 1999-2000. The results of these surveys are shown below.

#### **Live Fish Observed**

55 Chinook

#### **Redds Observed**

27 Chinook  
13 Unknown

#### **Carcasses Observed**

18 Chinook

**C9.2.1.3.2 1998-1999 Spawning Surveys**

One spawning surveys was conducted on December 16, 1999 on Savoy Creek during 1998-1999. The results of this survey are shown below.

**Live Fish Observed**  
20 Chinook

**Redds Observed**  
13 Chinook  
3 Unknown

**Carcasses Observed**  
1 Chinook

**C9.2.1.4 South Fork Rowdy Creek**

The survey reach extends from the confluence with Rowdy Creek upstream 4,000 feet to the confluence with Savoy Creek. It continues upstream from Savoy Creek an additional 3,500 feet to the anadromous barrier.

**C9.2.1.4.1 1999-2000 Spawning Surveys:**

Two spawning surveys were conducted on December 7<sup>th</sup> and 21<sup>st</sup>, 1999 on South Fork Rowdy Creek during 1999-2000. The results of these surveys are shown below.

**Live Fish Observed**  
53 Chinook  
2 Unknown

**Redds Observed**  
20 Chinook  
18 Unknown

**Carcasses Observed**  
15 Chinook

**C9.2.1.4.2 1998-1999 Spawning Surveys**

One spawning surveys was conducted on December 16, 1999 on South Fork Rowdy Creek during 1998-1999. The results of this survey are shown below.

**Live Fish Observed**  
20 Chinook

**Redds Observed**  
11 Chinook  
5 Unknown

**Carcasses Observed**  
4 Chinook  
1 Unknown

**C9.2.1.5 Wilson Creek**

The survey reach extends from the Pacific Ocean upstream 5,000 feet to the 1<sup>st</sup> W10 bridge and then 23,000 feet up to the last W10 bridge.

**C9.2.1.5.1 1999-2000 Spawning Surveys:**

One spawning surveys was conducted on December 16, 1999 on Wilson Creek during 1999-2000. The results of this survey are shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
1 Unknown

**Carcasses Observed**  
None Observed

## **C9.2.2 Coastal Lagoons HPA**

Spawning surveys have been conducted on three streams within the Coastal Lagoons HPA during the period of 1998 through 2000. The summaries of the results of these surveys follow.

### **C9.2.2.1 Maple Creek**

The spawning survey reach extends from the confluence with North Fork Maple Creek to the gauging station for 4,500 feet. The reach continues for an additional 12,000 feet upstream of the gauging station.

#### **C9.2.2.1.1 1999-2000 Spawning Surveys**

One spawning survey was conducted on February 9, 2000 on Maple Creek, tributary to Big Lagoon during 1999-2000. The results of these surveys are shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
None Observed

**Carcasses Observed**  
None Observed

#### **C9.2.2.1.2 1998-1999 Spawning Surveys**

Two spawning surveys were conducted on December 16, 1999 and January 8, 2000 on Maple Creek during 1998-1999. The results of these surveys are shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
None Observed

**Carcasses Observed**  
None Observed

### **C9.2.2.2 North Fork Maple Creek**

The survey reach extends from the confluence with Maple Creek to the F-4 bridge, approximately 4,500 feet. It continues upstream an additional 2,600 feet to the anadromous barrier.

#### **C9.2.2.2.1 1999-2000 Spawning Surveys**

One spawning survey was conducted on February 9, 2000 on North Fork Maple Creek during 1999-2000. The results of these surveys are shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
4 Unknown

**Carcasses Observed**  
None Observed

#### **C9.2.2.2.2 1998-1999 Spawning Surveys**

One spawning survey was conducted on December 16, 1999 and January 8, 2000 on North Fork Maple Creek during 1998-1999. The results of this survey are shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
None Observed

**Carcasses Observed**  
None Observed

### **C9.2.2.3 Pitcher Creek**

Pitcher Creek is surveyed from the confluence with Maple Creek upstream to the anadromous barrier, just past the F-2 road bridge, for a total distance of 4,200 feet.

#### **C9.2.2.3.1 1999-2000 Spawning Surveys**

One spawning survey was conducted on April 10, 2000 on Pitcher Creek during 1999-2000. The results of these surveys are shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
12 Unknown

**Carcasses Observed**  
None Observed

#### **C9.2.2.3.2 1998-1999 Spawning Surveys**

One spawning survey was conducted on January 8, 1999 on Pitcher Creek during 1998-1999. The results of this survey are shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
None Observed

**Carcasses Observed**  
None Observed

### **C9.2.3 Little River HPA**

Spawning surveys have been conducted on six streams within Little River HPA during the period of 1998 through 2000. The summaries of the results of these surveys follow.

#### **C9.2.3.1 Carson Creek**

Carson Creek is surveyed from its confluence with mainstem Little River to the bridge on the M-140 road, a total of 5,000 feet.

##### **C9.2.3.1.1 1998-1999 Spawning Surveys**

Two spawning surveys were conducted on December 17, 1998 and January 8, 1999 on Carson Creek, during 1998-1999. The results of these surveys are shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
6 Unknown

**Carcasses Observed**  
1 Chinook  
2 Unknown

#### **C9.2.3.2 Danielle Creek**

The survey reach extends from the confluence with mainstem Little River upstream approximately 2,500 feet.

***C9.2.3.2.1 1998-1999 Spawning Surveys***

One spawning survey was conducted on December 9, 1998 on Danielle Creek during 1998-1999. The results of these surveys are shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
None Observed

**Carcasses Observed**  
None Observed

***C9.2.3.3 Little River***

Due to the length and depth of Little River, only two reaches totaling approximately 15,500 feet have been regularly surveyed. This reach extends from the confluence of Carson Creek to the mouth of Railroad Creek for a distance of 7,500 feet and from the mouth of Lower South Fork Little River to the mouth of Upper South Fork Little River for a distance of an additional 8,000 feet.

***C9.2.3.3.1 1999-2000 Spawning Surveys***

Seven spawning surveys were conducted on December 16<sup>th</sup>, 20<sup>th</sup>, 30<sup>th</sup>, 1999 and February 7<sup>th</sup>, March 3<sup>rd</sup> and 17<sup>th</sup>, and April 2, 2000 on Little River during 1999-2000. The results of these surveys are shown below.

**Live Fish Observed**  
45 Chinook  
21 Steelhead

**Redds Observed**  
15 Chinook  
8 Steelhead  
106 Unknown

**Carcasses Observed**  
21 Chinook  
1 Steelhead  
1 Coho  
2 Unknown

***C9.2.3.3.2 1998-1999 Spawning Surveys***

One spawning survey was conducted during December 29 through 30, 1998 on Little River during 1998-1999. The results of this survey are shown below.

**Live Fish Observed**  
66 Chinook  
1 Coho  
6 Unknown

**Redds Observed**  
39 Chinook  
15 Unknown

**Carcasses Observed**  
17 Chinook  
1 Unknown

***C9.2.3.4 Upper South Fork Little River***

The spawning survey reach extends from the confluence with mainstem Little River upstream 5,000 feet to the V-Line bridge and then continues upstream an additional 2,300 feet to the anadromous barrier.



***C9.2.3.4.1 1999-2000 Spawning Surveys***

Two spawning surveys were conducted on December 13, 1999 and February 7, 2000 on Upper South Fork Little River during 1999-2000. The results of these surveys are shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
4 Unknown

**Carcasses Observed**  
4 Chinook

***C9.2.3.4.2 1998-1999 Spawning Surveys***

Two spawning surveys were conducted on December 9, 1998 and January 29, 1999 on Upper South Fork Little River during 1998-1999. The results of this survey are shown below.

**Live Fish Observed**  
13 Chinook  
4 Unknown

**Redds Observed**  
2 Chinook  
2 Unknown

**Carcasses Observed**  
None Observed

***C9.2.3.5 Lower South Fork Little River***

The spawning survey reach on Lower South Fork Little River extends from the confluence with mainstem Little River upstream 9,400 feet to the anadromous barrier.

***C9.2.3.5.1 1999-2000 Spawning Surveys***

Three spawning surveys were conducted on December 16, 1999, February 4<sup>th</sup> and March 24<sup>th</sup>, 2000 on Lower South Fork Little River during 1999-2000. The results of these surveys are shown below.

**Live Fish Observed**  
1 Chinook  
1 Steelhead

**Redds Observed**  
51 Unknown

**Carcasses Observed**  
6 Chinook  
2 Coho

***C9.2.3.5.2 1998-1999 Spawning Surveys***

Two spawning surveys were conducted on December 17, 1998 and January 29, 1999 on Lower South Fork Little River during 1998-1999. The results of this survey are shown below.

**Live Fish Observed**  
6 Chinook  
18 Coho  
2 Steelhead  
4 Unknown

**Redds Observed**  
3 Chinook  
12 Coho  
1 Steelhead  
48 Unknown

**Carcasses Observed**  
1 Unknown

***C9.2.3.6 Railroad Creek***

The spawning reach extends from the confluence with mainstem Little River upstream to the anadromous barrier approximately for a total of approximately 5,000 feet in length.

***C9.2.3.6.1 1999-2000 Spawning Surveys***

One spawning survey was conducted on February 7, 2000 on Railroad Creek during 1999-2000. The result of this survey is shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
9 Unknown

**Carcasses Observed**  
None Observed

***C9.2.3.6.2 1998-1999 Spawning Surveys***

One spawning survey was conducted on December 9, 1998 on Railroad Creek during 1998-1999. The result of this survey is shown below.

**Live Fish Observed**  
None Observed

**Redds Observed**  
None Observed

**Carcasses Observed**  
None Observed

**C9.2.4 Mad River HPA**

Spawning surveys have been conducted on one stream, Cañon Creek within the Mad River HPA during the period of 1998 through 2000. The summaries of the results of these surveys follow.

***C9.2.4.1 Cañon Creek***

The spawning survey reach for Cañon Creek extends from the confluence with the Mad River upstream 9,200 feet to the 4000 bridge. It then continues the 4000 bridge to the anadromous barrier, an additional 6,000 feet.

***C9.2.4.1.1 1999-2000 Spawning Surveys***

A total of nine surveys were conducted during the winter of 1999-2000. The dates of the surveys are November 11<sup>th</sup>, 19<sup>th</sup>, 22<sup>nd</sup>, and 30<sup>th</sup>, December 6<sup>th</sup>, 15<sup>th</sup>, and 27<sup>th</sup>, 1999; January 5<sup>th</sup> and February 8<sup>th</sup>, 2000. The results of these surveys are shown below.

**Live Fish Observed**  
202 Chinook  
1 Coho  
12 Steelhead  
4 Unknown

**Redds Observed**  
73 Chinook  
3 Steelhead  
65 Unknown

**Carcasses Observed**  
66 Chinook  
1 Coho  
10 Steelhead  
2 Unknown

***C9.2.4.1.2 1998-1999 Spawning Survey***

Two surveys were conducted during the winter of 1998-1999. These were December 12<sup>th</sup>, 1998 and January 4<sup>th</sup>, 1999. The results of these surveys are shown below.

**Live Fish Observed**  
66 Chinook

**Redds Observed**  
32 Chinook  
30 Unknown

**Carcasses Observed**  
6 Chinook

***C9.2.4.1.3 1997-1998 Spawning Survey***

Two surveys were conducted during the winter of 1997-1998. These were conducted on December 6<sup>th</sup> and 29<sup>th</sup>, 1997. The results of these surveys are shown below.

<b>Live Fish Observed</b>	<b>Redds Observed</b>	<b>Carcasses Observed</b>
30 Chinook	20 Chinook	22 Chinook
3 Steelhead	2 Steelhead	1 Coho
2 Unknown	81 Unknown	

***C9.2.4.1.4 1996-1997 Spawning Survey***

One survey was conducted during the winter of 1996-1997. This survey was conducted during December 17<sup>th</sup> through 19<sup>th</sup>, 1996. The results of these surveys are shown below.

<b>Live Fish Observed</b>	<b>Redds Observed</b>	<b>Carcasses Observed</b>
110 Chinook	42 Chinook	7 Chinook
4 Coho	1 Coho	1 Coho
3 Unknown	4 Unknown	1 Unknown

***C9.2.4.1.5 1995-1996 Spawning Survey***

One survey was conducted during the winter of 1995-1996, on December 10<sup>th</sup>, 1995. The results of these surveys are shown below

<b>Live Fish Observed</b>	<b>Redds Observed</b>	<b>Carcasses Observed</b>
73 Chinook	27 Chinook	4 Chinook
3 Coho	1 Coho	
	3 Unknown	

**C9.2.5 North Fork Mad River HPA**

Spawning surveys have been conducted on two streams, North Fork Mad River and Sullivan Gulch within the North Fork Mad River HPA during the period of 1996 through 2000.

***C9.2.5.1 North Fork Mad River***

The spawning survey reach of NF Mad River extends from the confluence with Mad River upstream 11,500 feet to the county bridge at Korb. The reach continues upstream from the county bridge at Korb upstream 9,600 feet to the anadromous barrier, just downstream of the first bridge on the K&K road.

C9.2.5.1.1 Spawning Survey 1999-2000

One spawning survey was conducted on NF Mad River during the winter of 1999-2000. The survey date was December 29, 1999. The summaries of the results of this survey follow.

**Live Fish Observed**

76 Chinook  
3 Steelhead  
3 Unknown

**Redds Observed**

42 Chinook  
65 Unknown

**Carcasses Observed**

21 Chinook  
7 Unknown

C9.2.5.1.2 Spawning Survey 1998-1999

Two spawning surveys were conducted on NF Mad River during the winter of 1998-1999. These survey dates were December 11<sup>th</sup> and 21<sup>st</sup>, 1998. The summaries of the results of these surveys follow.

**Live Fish observed**

42 Chinook  
1 Steelhead  
4 Unknown

**Redds Observed**

15 Chinook  
47 Unknown

**Carcasses Observed**

28 Chinook  
5 Unknown

C9.2.5.1.3 Spawning Survey 1997-1998

Two spawning surveys were conducted on NF Mad River during the winter of 1997-1998. The survey dates were December 5<sup>th</sup> and 31<sup>st</sup>, 1997. The summaries of the results of these surveys follow.

**Live Fish Observed**

121 Chinook  
3 Coho  
4 Unknown

**Redds Observed**

65 Chinook  
18 Unknown

**Carcasses Observed**

61 Chinook  
1 Unknown

C9.2.5.1.4 Spawning Survey 1996-1997

Two spawning surveys were conducted on the NF Mad River during the winter of 1996-1997. The survey dates were December 2, 1996 and January 16, 1997. The summaries of the results of these surveys follow.

**Live Fish Observed**

214 Chinook  
5 Unknown

**Redds Observed**

213 Chinook  
7 Unknown

**Carcasses Observed**

293 Chinook  
2 Steelhead  
20 Unknown

**C9.2.5.2 Sullivan Gulch**

The spawning survey reach on Sullivan Gulch extends from the confluence with North Fork of the Mad River upstream to the anadromous barrier. This is a total distance of approximately 2,600 feet.

C9.2.5.2.1 Spawning Survey 1999-2000

Four spawning surveys were conducted on Sullivan during the winter of 1999-2000. The survey dates were December 10<sup>th</sup> and 15<sup>th</sup>, 1999, January 21<sup>st</sup>, and February 2<sup>nd</sup>, 2000. The summaries of the results of this survey follow.

**Live Fish Observed**

25 Chinook

**Redds Observed**

9 Chinook  
13 Unknown

**Carcasses Observed**

4 Chinook  
2 Coho  
1 Unknown

C9.2.5.2.2 Spawning Survey 1998-1999

Two spawning surveys were conducted on Sullivan Gulch during the winter of 1998-1999. These survey dates were December 11<sup>th</sup> and 28<sup>th</sup>, 1998. The summaries of the results of these surveys follow.

**Live Fish Observed**

12 Chinook  
1 Coho

**Redds Observed**

7 Chinook  
14 Unknown

**Carcasses Observed**

None Observed  
None Observed

C9.2.5.2.3 Spawning Survey 1997-1998

One spawning survey was conducted on Sullivan Gulch during the winter of 1997-1998. The survey date was December 21<sup>st</sup>, 1997. The summaries of the results of these surveys follow.

**Live Fish Observed**

1 Coho  
1 Unknown

**Redds Observed**

1 Coho  
10 Unknown

**Carcasses Observed**

None Observed

C9.2.5.2.4 Spawning Survey 1996-1997

One spawning survey was conducted on Sullivan Gulch during the winter of 1996-1997. The survey date was January 9, 1997. The summaries of the results of these surveys follow.

**Live Fish Observed**

220 Chinook  
5 Steelhead  
1 Coho

**Redds Observed**

108 Chinook  
2 Steelhead

**Carcasses Observed**

102 Chinook  
18 Unknown

**C9.2.6 Humboldt Bay HPA**

Spawning surveys have been conducted on one stream, Salmon Creek, within the Humboldt Bay HPA once during the period of 1995 through 2000.

### **C9.2.6.1 Salmon Creek**

Spawning surveys were conducted from the County Bridge on Tompkins Hill Road upstream 8,000 feet to the second temperature recording station, just downstream of the road F-1400 bridge. Additional spot checks were made near the Walsh bridge approximately 14,000 feet upstream.

#### **C9.2.6.1.1 Spawning Survey 1998-1999**

One spawning survey was conducted on Salmon Creek during the winter of 1998-1999. The survey date was January 12, 1999. The summaries of the results of this survey follow.

#### **Live Fish Observed**

None Observed

#### **Redds Observed**

7 Unknown

#### **Carcasses Observed**

None Observed

## **C9.3 DISCUSSION**

Chinook and coho relative abundance within the HPAs have fluctuated since monitoring began in 1995. The Smith River HPA, which includes South Fork Winchuck River, Rowdy Creek, Savoy Creek, South Fork Rowdy Creek and Wilson Creek, has been monitored for adult returns since 1998. Spawning surveys within these streams is sporadic, and often only conducted once in a season. Based on observed returns, no coho were seen during surveys in this HPA. Chinook were fairly common and easily distinguished during surveys. Based on late season results, it appears an adequate number of adult chinook annually escape in this HPA. Although spawning surveys have not detected adult coho, juvenile dive counts and electrofishing within these streams frequently find coho. Their numbers, however, are very low, which may factor into low observed escapement numbers. Steelhead are often seen during late winter surveys in small numbers, however juvenile population estimates within this HPA indicate that adult escapement may be much higher.

The Coastal Lagoon HPA which includes spawning survey reaches on North Fork Maple Creek, Maple Creek and Pitcher Creek are streams that are subject to irregular entry by returning salmonids. These systems are regulated by high flow events that allow for the breaching of the sand spit, which would otherwise block the entry of salmonids into their natal streams. Based on spawning survey results since 1998, it is unclear whether adequate adult escapement is received in these streams due to the timing of when the lagoon breaches. Numerous adult cutthroat trout were incidentally observed in the lower reaches of Maple Creek during a training session of the summer population estimate protocol in 1999. It is not known if the adult cutthroat were either anadromous or "lagoon run". "Lagoon run" fish may utilize the lagoon in the same way anadromous fish utilize the ocean. Age 0+ and 1+ chinook as well as two 18-inch chinook (also possibly "lagoon run" chinook) were observed during the training session. Age 1+ coho were seen in Pitcher Creek during summer 1999, however no 0+ coho were observed in the system. This indicates that the timing of when the lagoon breaches plays an important role in determining if, when or what species enter the Maple Creek system. The absence of 0+ coho during the summer of 1999 indicates that Big Lagoon did not breach during the 1998/1999 coho run, but the presence of 1+ coho indicates that adults were able to enter during the 1997/1998 spawning season. During the formal spawning surveys only redds of unknown species have been found late in the survey season. It is likely these

redds where created by anadromous or “lagoon run” cutthroat or by steelhead that were able to enter the lagoon during high winter flow. All four covered salmonid species have been observed in the Coastal Lagoon HPA, however cutthroat is the only species that have been seen in the adult form.

The Little River HPA is currently the most actively surveyed HPA for adult escapement. Surveys are conducted on six streams, which include Carson Creek, Danielle Creek, main stem Little River, Upper South Fork Little River, Lower South Fork Little River and Railroad Creek. Surveys on these streams have only been conducted since 1998, since the acquisition of the Louisiana Pacific land holdings. The main stem Little River has the highest totals of both redds, live fish and carcasses. The second largest counts have been observed on Lower South Fork Little River. The majority of spawning activity appears to be by chinook, however coho and steelhead are occasionally observed during surveys. Although these surveys would indicate very little spawning activity by these species, they are extremely abundant during summer juvenile dive counts and out-migrant trapping, indicating a fair number of adults are not observed during escapement surveys. This is often a result of survey limitations due to high flows, which often reduce visibility and flush carcasses. Survey frequency and timing are important, but even with the increased surveys adult salmonids will be missed, making it very difficult to rely on adult counts as an intricate component of the monitoring program.

Cañon Creek is currently the only stream surveyed in the Mad River HPA. Survey frequency, spacing and duration have helped to make it the most well monitored creek for adult escapement. Chinook are the most common species observed, followed by steelhead and coho salmon, respectively.

The North Fork Mad River HPA consists of two survey streams, Sullivan Gulch and North Fork Mad River. Chinook are the most frequently recorded species in North Fork Mad River, followed by steelhead and coho, respectively. Chinook salmon escapement appears robust, with only one to two surveys each season recording large adult returns. Steelhead are fairly common in early winter surveys, but the majority of survey dates in late December are probably too early to record significant numbers. Coho are infrequently observed; however, this is likely a factor of water visibility and survey timing. Sullivan Gulch, has been surveyed since 1996. Limited numbers of chinook, coho and steelhead have been observed. Chinook are the most frequently recorded salmonid, but steelhead may also make up a significant component of the survey if conducted later in the year. Based on juvenile population estimates, however, coho also make up a significant portion of the adult run, although they are rarely observed during spawning surveys.

Spawning surveys in the Humboldt Bay HPA are only conducted in Salmon Creek. Surveys were first conducted in 1998, with only seven redds being identified. Limited winter access into the watershed and visibility generally prevents effective survey coverage of the stream. Also, near the mouth of Salmon Creek, a tide gate may limit upstream migration into the watershed.

## **C9.4 CONCLUSIONS**

Salmonid escapement surveys have helped to show that returning adult populations are using the majority of anadromous habitat available in monitored HPA streams. Opportunistic surveys looking at chinook and coho escapement may be helpful in

examining age structure, sex ratios, migration timing and hatchery infiltration, however the number of HPA streams, high flows and water visibility limit the utility of the surveys to draw definitive conclusions for adult escapement estimates. Similar information would be helpful for cutthroat and steelhead adults within Plan Area streams, but only limited data can be collected on these species due to variations in their life history patterns, high flows, water conditions and the basic behaviors of the adult fish. Other survey methods such as summer juvenile fish population monitoring and out-migrant trapping are more reliable and consistent approaches to monitor population trends. The spawning surveys may help develop an understanding marine survival, however a much more intensive survey methodology would need to be employed such as adult traps installed across the ownership which would also be best combined with the monitoring of other freshwater life history stages.